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TOWNSHIP OF BERTIE - 1968
COUNTY OF WELLAND

THE
ONTARIO WATER RESOURCES
COMMISSION

WATER POLLUTION SURVEY

of the

TOWNSHIP OF BERTIE

COUNTY OF WELLAND

1968

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1968
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Report on a water pollution
survey of the township of Bertie,
county of Welland /

80483

REPORT
on
WATER POLLUTION SURVEY
of the

TOWNSHIP OF BERTIE
COUNTY OF WELLAND

1968

Prepared By: District Engineers Branch
Division of Sanitary Engineering

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TOWNSHIP OF BERTIE
Water Pollution Survey

INTRODUCTION

A water pollution survey was carried out in the Township of Bertie during the months of July and August, 1968.

The report contains information based on extensive field work by various branches of the Division of Sanitary Engineering, and staff of the Niagara District Health Unit. Also included is certain data available in Commission files on existing water and pollution control facilities.

The basic intent of the report is to outline the current and future requirements with respect to water supply and waste disposal within the boundaries of the township. In this regard, the adequacy of municipal and private water supplies, and pollution control facilities are reviewed in order to indicate where improvements are presently required.

The ultimate objective of the survey and the report is to make recommendations concerning general policies to be followed in the field of water supply and wastewater treatment for future development within the township.

PRESENTATION

The first part of the report deals with a general description of the township and the availability and quality of water resources.

The subsequent section deals with the existing water supply systems and the pollution control works and their respective efficiencies.

This is followed by a review of the quality of the water in Lake Erie, along the boundary of the township, with respect to the influence on it made by the discharge of various streams and watercourses, and by other activities on the lake shoreline.

Finally, the report reviews what existing use is made of the individual watercourses and its potential as a receiving stream for municipal and private waste treatment plant effluents.

GEOGRAPHY AND GEOLOGY

1. Location

The Township of Bertie is situated at the southeast corner of the County of Welland. It is bounded by Lake Erie on the south, Township of Willoughby on the north, the Niagara River on the east and the Township of Humberstone on the west. It covers 57.35 square miles and its 1967 assessed population was 9,512. However, the estimated summer population, when including those from the cottage development along the shores of Lake Erie, rises to 16,000. The shoreline is dotted with public and private bathing beaches throughout the length of the township.

2. Topography

The surface features of the township are predominantly plains of stratified clay providing an imperfect to poor drainage. The soil overburden varies from very shallow (12-inches) to approximately 30 feet in depth. The nearly level plain, which covers most of the township, is at an elevation of 600 feet above sea level and is only slightly broken by lightly undulating hills. Lake Erie elevation, at this point, is 570.4 feet.

Inland limestone plains appear at a number of locations throughout the township. The three such longest plains are located at Humberstone-Bertie Townline, a strip bordering the side of the Six-Mile Creek, and a ridge of limestone extending from Ridgeway to the Queen Elizabeth Way stretching along the south shore of Beaver Creek.

WATER SUPPLY

Approximately 80 per cent of the township population is served with municipal water. The water is obtained from Lake Erie at the Bertie Township water treatment plant located at the base of Rosehill Road. This plant, operated by the OWRC, consists of a 45 mgd micro-strainer followed by chlorination.

The water distribution system serves most of the developed area in the southern portion of the municipality. Water services are also extended along Gorham Road to the

Hamlet of Stevensville. For emergency purposes the municipality has valved water main interconnections with the Town of Fort Erie and the Village of Crystal Beach.

DRAINAGE

The southern portion of the township, bounded by the CNR line west of Ridgeway and Highway 3 on the east side, is drained towards Lake Erie. The balance of the township is drained to the Niagara River.

The Six-Mile Creek and a number of other small watercourses and municipal storm drains receive the drainage in the south portion of the township. The Black Creek, with its tributaries, and a number of other small watercourses drain the northern portion of the township to the Niagara River. That portion of the municipality which drains to Lake Erie has a permanent population of 6,000 and an estimated summer population in excess of 13,000.

Black Creek, at the present time, is the only watercourse which is used as a source of communal water supply. The Hamlet of Douglastown, in the Township of Willoughby, obtains its water supply from this stream. Black Creek originates in the marshlands in Humberstone Township. Its flow is very sluggish, and almost non-existent during dry weather. The

back-up water of the Niagara River affects the creek as far south as the Michigan Central Railway line. The quality of the water in this stream is affected by drainage from the agricultural lands and municipal storm drains from Ridgeway and Stevensville.

The quality of the water in Black Creek and its tributaries is presented in Table I.

WATER POLLUTION

There are no municipal sanitary sewer services in the township. Individual septic tank systems are the most commonly used methods for domestic waste disposal. The survey revealed that, without exception, all urban areas throughout the township were experiencing problems with malfunctioning septic tank systems. In the majority of locations the cause is poor soil drainage due to heavy clay, shallow overburden and/or high ground water table.

A Sanitary Survey Report, recently prepared by the Niagara District Health Unit, discusses in detail the existing problems associated with disposal of domestic wastes in all urban areas of the township. Particular emphasis were given to the southern urban centres which drain to Lake Erie. These are as follows:

	<u>Population</u>
Bay Beach	1900
Ridgeway	2100
Thunder Bay	1775
Crescent Park	3300
Waverly Beach	704
Erie Beach	664

A portion of Ridgeway is drained to Beaver Creek, a tributary of Black Creek, which finally flows into Niagara River.

The total flow from the main storm sewer outlets to Lake Erie, during dry weather, was estimated to be in the neighborhood of 0.5 million gallons per day. The water along the shoreline, in the vicinity of these outfalls, was covered with abundant algae. In certain areas the odour of decaying algae mixed with sewage was strong.

The quality of the effluent, found at the various storm sewer outlets as shown in the appended drawing number 69-3-DE, is presented in Table II.

The findings in the above-mentioned table indicate that, without exception, sewage treatment facilities are urgently required in all of the urban areas noted above.

ABINO BAY WATER QUALITY SURVEY

In addition to the township pollution survey, a water quality study of the Abino Bay was carried out during July and August 1968.

The basic intent of the survey was for the following reasons:

- 1) To determine the general quality of the bay water.
- 2) To determine the influence on the quality of the water by the summer activity, such as bathing and boating.
- 3) To determine the impairment caused by drainage from the surroundings shoreline developments, and the local marshlands.

GEOGRAPHY

Abino Bay, for the purpose of the report, will be considered that portion of Lake Erie lying between Abino Point and a small projection into the lake near the east limits of the Village of Crystal Beach. The entire bay is used as a summer resort for bathing, power boating, sailing and fishing.

The Village of Crystal Beach obtains its water supply from this bay. It also discharges the effluent from its sewage treatment facilities near the east limits of the same bay. The bay is also used as a receiver of drainage from the surrounding unserviced developments and from the marshlands on its west side.

With the exception of the Crystal Beach sewage treatment plant outfall, all other discharges are at the shoreline.

WATER QUALITY

During the course of the survey several hundred samples of water were collected using 21 established stations in a grid system across the bay. The locations of the sampling points in the bay have been presented on the enclosed drawing--68-G-76. Additional data was obtained from the existing monitoring stations and was also incorporated in this report.

The OWRC mobile bacteriological laboratory was established at Crystal Beach for the duration of the July survey, and at the Niagara District Health Unit at Welland during the August run.

The results of the water analyses are summarized in Table III. A brief resume of the significance of the laboratory analyses results as reported in the charts has been appended to the report.

Abino Bay is approximately 4.0 miles across its mouth and extends about 2.5 miles at the furthest point from the shoreline. The depth of water does not exceed 20 feet at the deepest point. The shoreline of the bay, with exception of a marshy stretch along the base of Abino Point, is covered with sand. The entire north shoreline, from the premises of the

Buffalo Canoe Club to the old shipping pier at Crystal Beach, is developed with private bathing beaches. The east shoreline, in the marshy area, is dotted with private and public docking facilities. The bottom of the bay was found to be that of sand cover over rock. Aquatic weed growth was found to be patchy throughout the bay. In certain other areas the bottom was covered with decaying algae and other organic matter. In these areas there was little or no plant life in the water.

POLLUTION

The existing establishments which can be classed as potential contributors of pollution to the bay are as follows:

- 1) Village of Crystal Beach - discharging treated sewage effluent at the east end of the beach.
- 2) Township of Bertie - discharge from the unsewered cottage development.
- 3) Buffalo Canoe Club - effluent from the septic tank systems.
- 4) Swamp and marsh drainage along the west shoreline.
- 5) Buffalo Yacht Club - pleasure craft docking facilities with no provisions for dockside receiving of toilet and kitchen wastes.
- 6) Pollution caused by oil from heavy concentration of power boat activity.

OBSERVATIONS

The visual observations made during the course of the survey were as follows:

1. The water throughout the entire bay, with the exception of a strip approximately 100 yards wide along the west shore, was noted to be fairly clear. Patches of oil slick were a common sight in the areas of intensive power boat activity.

2. The water along the side of the Abino Point shoreline was noted to be tea-coloured. This condition was attributed to a number of small streams which drain the local marshlands, and groups of cottage areas.

3. Throughout most of the bay, where the bottom was clearly visible, fish life appeared to be abundant. Such fish as perch, catfish, bass and carp were noted to be particularly plentiful in the shallow waters. Through the entire duration of the survey very few dead fish were noted in the water.

4. The temperature of the bay water, during the survey, ranged from 20°C to 23°C. Temperature of the water at the surface and at the bottom was found to be the same at the time of measurement.

5. The pH remained fairly constant at 8.6 throughout the bay, with the exception of the area at the base of Abino Bay where it was slightly less alkaline (8.1).

6. On occasions, during the survey and at the time of the west wind, algae bloom was noted in the bay and subsequently washed up on certain beaches, or settled to the bottom rocky and weedy areas. Also, during times when the wind was from the west, curd which had settled on the bottom was stirred up and floated into shore. This curd, made up of algae and other organic matter, came up in various size slabs, and exhibited a very strong sulphide odour when broken up. A great amount of this sediment was found on the bottom just off Abino Point. When stirred up this material normally floated in the direction of the bathing beaches. It was noted that, on such occasions, large blooms of algae would occur leaving massive deposits of algae and the above-mentioned curd on the bathing beaches and adjacent shoreline.

A number of studies indicated that the currents in Abino Bay are governed by the direction of the wind. Testing for current movement by use of dyes and drogues revealed that there is no set pattern of currents inside the bay. However, in the open waters beyond the projection of Point Abino, the littoral drift is eastward towards the Niagara River. This was particularly noticeable off the land point at Crystal Beach. Strong winds from the west normally flush out the sediments collected along the Abino Point shoreline and move them in an

easterly direction across the bay towards Crystal Beach and finally into flow of the Niagara River. This likely accounts, in part, for the muddy waters, with concentration of organic solids as noted in the intake well of the Crystal Beach water treatment plant. Therefore, any additional development along the Abino Point shoreline of the bay, which would further add to the pollution of the bay water, will only create further difficulties at the above water treatment plant, and the deterioration of the bathing beaches.

SUMMARY AND CONCLUSIONS

A pollution survey of the Township of Bertie was carried out jointly with staff of the Niagara District Health Unit to establish the need for municipal sewer services throughout the developed area of the municipality.

The survey revealed that, without exception, municipal sewerage services are urgently required in all urban areas. This includes all summer cottage developments along the lake.

Also, particular care should be exercised in permitting development of docking facilities which may extend any long distance into the bay and possibly restrict free movement of water along the bathing beaches.

The existing condition in the bay along Point Abino would indicate that any indiscriminate development will result

in a still greater impairment of the bay water, and deterioration of the bathing beaches.

It is recommended that all new proposals for subdivision or any other development should be considered premature until municipal sewer services are available.

Prepared by:

Wayne Smith
A. Matwichuk,
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Division of Sanitary Engineering.

/kc

T A B L E I

WATER QUALITY IN BLACK CREEK

<u>SAMPLE POINT</u>	<u>LOCATION</u>	<u>5-DAY BOD in ppm</u>	<u>SUSP. SOLIDS in ppm</u>	<u>ANIONIC DETERGENTS in ppm</u>	<u>TURBIDITY UNITS</u>	<u>FREE AMMONIA in ppm</u>	<u>NITRATE NO₃ in ppm</u>	<u>PHOSPHORUS PO₄</u>	<u>MF COLIFORMS per 100 ML</u>
BL -4.1	Lower Dam	3.3	344	0.2	300	0.23	0.30	0.07	4800
BL -4.8	Gorham Rd.	3.1	496	0.1	---	0.25	0.20	0.03	2700
BL -5.5	Upper Dam	2.9	352	0.1	300	0.25	0.25	0.03	1500
BLS-6.1	Trib."A"	2.8	272	0.1	---	0.25	0.50	0.06	900
BLS-6.5	Trib."B"	3.3	372	0.1	300	0.25	0.20	0.03	1300
BL -7.2		2.5	266	0.1	300	0.20	0.20	0.02	1300
BLS-7.5	Trib."C"	2.6	278	0.1	300	0.20	0.25	0.05	430
BL -8.1	Welland Co- unty Rd.24	2.4	276	0.1	300	0.26	0.30	0.06	480
BLB-8.3	Beaver Creek at Gorham Rd.	27.0	282						70000
	"								
BL -0.1	Niagara Blvd.	1.8	36		48	0.23	0.18	0.29	8500

SANITARY SURVEY--BERTIE TOWNSHIP AREA

DRAIN OUTFALLS TO LAKE ERIE
AS SHOWN ON DRAWING 69-3-DE

Check Points

- 1 Culvert--Radford near Dominion
- 2 Ditch @ 52 Queens Blvd. near George Street
- 2a Albert Street sewer outfall
- 3 Ditch at 42 Bardol Rd.--Erie Beach
- 3a Basset Street drain
- 3b Helena Street drain
- 4 Ditch at Edgemere & Beachview
- 5 Ditch at Edgemere & Rose Road
- 6 Ditch at Kraft and Edgemere
- 7 Ditch at 1103 Edgemere
- 8 Crescent Road at lake
- 8a Crescent Road at railroad tracks
- 9 Ditch at 29 Kam Road
- 10 Buffalo Road drain at lake
- 11 Ditch at Kraft near Dominion
- 12 Ditch at Jamboree Drive-In
- 13 Ditch at lake between Rosehill Rd. and Bertie Bay Road
- 14 Bertie Bay Road Drain
- 16 Windmill Point at Mott's Place
- 17 Ditch at Windmill Point East
- 18 Drain at Schintzius in Stanland Park--development of Sub-div.
- 19 Storm Drain at Connelly at Windmill Point
- 20 Bardol at Windmill Point
- 21 Drain at Ernst--steel culvert
- 22 Concrete culvert at Ernst--
- 23 Six Mile Creek at Thunder Bay Road
- 24 Six Mile Creek at lake
- 25 Small ditch at Thunder Bay
- 26 Small drainage ditch at Burleigh Road
- 27 Crystal Beach Sewage Treatment Plant--Effluent
- 28 Dimmick drain at beach
- 29 Coatsworth drain
- 30 Ditch at Fisher--Point Abino Road
- 31 Ditch at Abino Hills (Marsh Drain)
- 32 Ditch at Point Abino (Private)

- 40 Mann Drain at Prospect Point Road
- 41 Mann Drain at Burleigh Road

NOTE:

These sampling points were utilized to correspond with those used by the Niagara District Health Unit for their Survey of 1968.

TABLE II

TOWNSHIP OF BERTIE
DRAIN OUTFALLS TO LAKE ERIE

JULY AND AUGUST 1968

<u>SAMPLE POINT</u>	<u>5 DAY BOD (ppm)</u>	<u>SUSP. SOLIDS (ppm)</u>	<u>ABS-ANIONIC DET (ppm)</u>	<u>MF COLIFORMS per 100ml</u>
1	7.2	3	1.7	2,300,000
2	110.0	278	42.0	8,600,000
3	66,30	45,33	6.8,3.7	26,000,000
4	155.0	51	2.8	3,500,000
5	52.0	42	5.9	9,000,000
6	7.6	93	0.7	1,030,000
7	1.0		0.1	3,300
8	40.0	62	16.3	11,000,000
9	10.0	36	1.8	1,500,000
10 *				30,000-5,000
11				
12	1.0	44	0.1	300,000
13 *				250,000
14	3.6	34	0.6	2,500,000
16 *				5,300
17	7.0		0.0	6,500
18 *				8,000,000
19 *				5,500
20 *				80,000,000
21	7.0	32	0.0	8,000,000
22 *				8,000,000
23	2.2		0.1	830
24 *				3,600
25 *				80,000
26 *				4,700,000
27	0.8	5	0.0	8,000,000
28	50.0	135	1.2	3,100
29 *				4,200
30	130,65	72,658	3.7,0.3	2,700,000
31 *				8,000,000
32 *				5,400
33 *				14,000
40	64.0	52	18	210,000,000
41	504.0	20	0.7	680,000

* Samples taken by the Niagara District Health Unit.

TABLE III

TOWNSHIP OF BERTIELAKE ERIE - ABINO BAYWATER QUALITY SURVEY 1968

<u>SAMPLING STATION</u>	<u>5-DAY BOD</u>	<u>SOLIDS</u>		<u>NITRATE AS NO₃</u>	<u>TOTAL KJELDAHL</u>	<u>PHOSPHORUS AS PO₄</u>	<u>PHENOLS IN ppb</u>	<u>pH</u>	<u>DISSOLVED OXYGEN</u>
		<u>Total</u>	<u>Susp.</u>						
1	1.1	208	5	0.00	0.48	0.08	2	8.6	12
1A	---	---	-	----	----	----	2	---	--
2	0.8	210	3	0.05	0.10	0.03	2	8.6	12
2A	1.2	200	7	0.00	----	----	2	---	--
3	1.1	190	3	0.00	0.16	0.05	0	8.6	12
3A	0.6	210	5	0.00	----	----	2	---	--
4	1.4	212	12	0.01	0.30	0.09	4	8.6	12
4A	2.5	---	-	----	----	----	0	---	--
5	0.9	196	5	0.00	0.14	0.07	2	8.6	12
5A	1.4	192	5	0.01	----	----	2	---	--
6	0.7	210	3	0.00	0.18	0.06	2	8.6	12
6A	0.7	206	3	0.00	----	----	2	---	--

SAMPLING STATION	5-DAY BOD	SOLIDS		NITRATE AS NO ₃	TOTAL KJELDAHL	PHOSPHORUS AS PO ₄	PHENOLS IN ppb	pH	DISSOLVED OXYGEN
		Total	Susp.						
7	0.8	198	2	0.00	0.14	0.05	2	8.6	12
7A	1.1	216	14	0.01	0.10	----	2	---	--
8	0.7	194	3	0.00	0.24	0.08	2	8.6	12
8A	0.4	212	8	0.00	0.05	----	2	---	--
9	1.0	198	8	0.01	0.30	0.11	2	8.1	10
9A	---	---	-	----	----	----	20	---	--
10	0.7	218	5	0.00	0.36	0.23	6	8.1	9
10A	---	---	-	----	----	----	2	---	--
11	0.7	188	3	0.00	0.20	0.06	2	8.6	12
11A	---	---	-	----	----	----	-	---	--
12	0.8	208	3	0.00	0.22	0.07	0	8.6	12
12A	0.8	194	4	0.00	----	----	2	---	--
13	0.9	208	4	0.00	0.20	0.06	2	8.6	12
13A	0.8	190	9	0.00	0.16	0.06	2	---	--

<u>SAMPLING STATION</u>	<u>5-DAY BOD</u>	<u>SOLIDS</u>		<u>NITRATE AS NO3</u>	<u>TOTAL KJELDAHL</u>	<u>PHOSPHORUS AS PO4</u>	<u>PHENOLS IN ppb</u>	<u>pH</u>	<u>DISSOLVED OXYGEN</u>
		<u>Total</u>	<u>Susp.</u>						
14	1.0	204	4	0.00	0.16	0.05	21	8.6	12
14A	---	---	-	0.00	0.18	0.05	4	---	--
15	1.0	200	3	0.00	0.20	0.06	11	8.6	12
15A	1.00	212	6	0.02	0.30	0.09	--	---	--
16	1.0	204	3	0.00	0.16	0.06	0	8.6	12
17	0.8	200	3	0.00	0.19	0.07	4	8.6	12
18	0.9	195	3	0.00	0.12	0.05	0	8.6	12
19	0.9	190	3	0.00	0.20	0.17	3	8.6	12
20	0.8	208	3	0.00	0.19	0.09	2	8.6	12
21	2.5	236	48	0.01	0.51	0.33	4	8.6	12
4-AA	0.8	216	5	0.00	0.16	0.12	--	8.6	12
40	---	---	-	0.00	0.13	0.12	0	8.5	11.0
42	---	---	-	0.05	0.10	0.08	0	8.6	8.5
44	---	---	-	0.03	0.07	0.07	0	8.7	12.5

APPENDIX I

SIGNIFICANCE OF LABORATORY ANALYSES

Bacteriological Examination

The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. The objectives for surface water quality in Ontario is a maximum of 2400 organisms per 100 millilitres.

The OWRC Laboratories employ the Membrane Filter (MF) technique of examination to obtain a direct enumeration of coliform organisms. The Department of Health Laboratories use the Most Probable Member (MPM) enumeration and coliform counts are reported as Total Coliform Organisms (TC) and Faecal Coliform Organisms (FC).

Sanitary Chemical Analyses

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (PPM) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under the controlled incubation temperature of 20°C.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids

The value for solids, expressed in parts per million,

is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide: low less than 0.1 ppm; moderate 0.1 to 1.0 ppm; high greater than 1.0 ppm.

Phosphorus

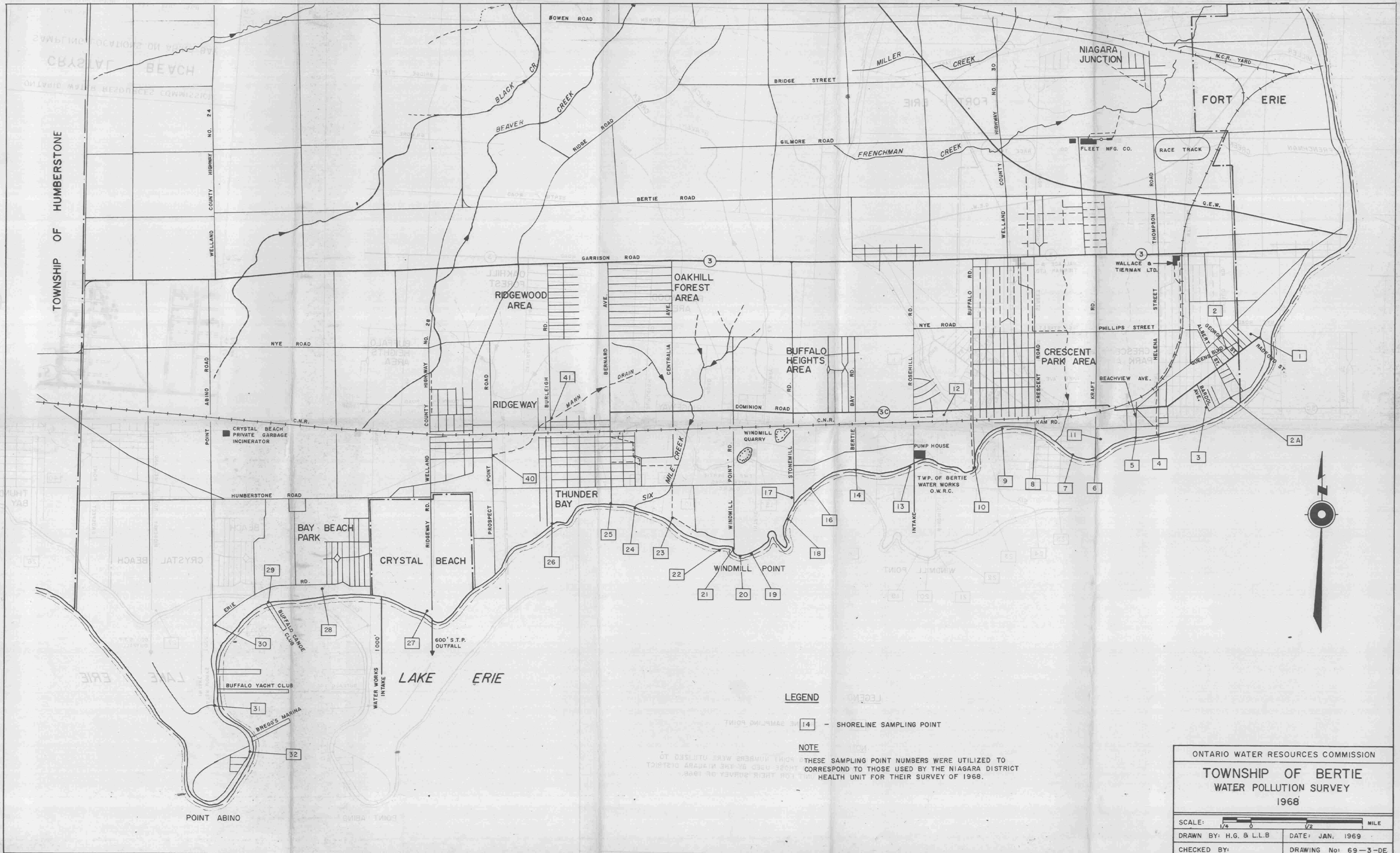
Phosphorus and nitrogen concentrations appear to be most important factors regulating the biological productivity in water. It is generally accepted that nitrogen determines the extent of productivity and phosphorus controls the speed with which growth occurs. Nitrogen-phosphorus ratios of 30:1 and 15:1 have been reported as optimal for the growth of algae. Important sources of phosphorus are domestic and certain industrial wastes. To inhibit the growth of algae the level of inorganic phosphorus in the water should be not in excess of 0.01 parts per million.

Anionic Detergents as ABS

The presence of anionic detergents as ABS is an indication that domestic waste is present.

Phenols

The presence of phenol or phenolic equivalents is generally associated with discharges containing petroleum products, or with wastes from some industries. It is generally conceded that adequate protection of surface waters will be provided if the concentration of phenols in waste discharges does not exceed 20 parts per billion (ppb). Phenolic type waste can cause objectionable conditions in water supplies and might taint the flesh of fish.



LEGEND

14 - SHORELINE SAMPLING POINT

NOTE

THESE SAMPLING POINT NUMBERS WERE UTILIZED TO CORRESPOND TO THOSE USED BY THE NIAGARA DISTRICT HEALTH UNIT FOR THEIR SURVEY OF 1968.

ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF BERTIE
WATER POLLUTION SURVEY
1968

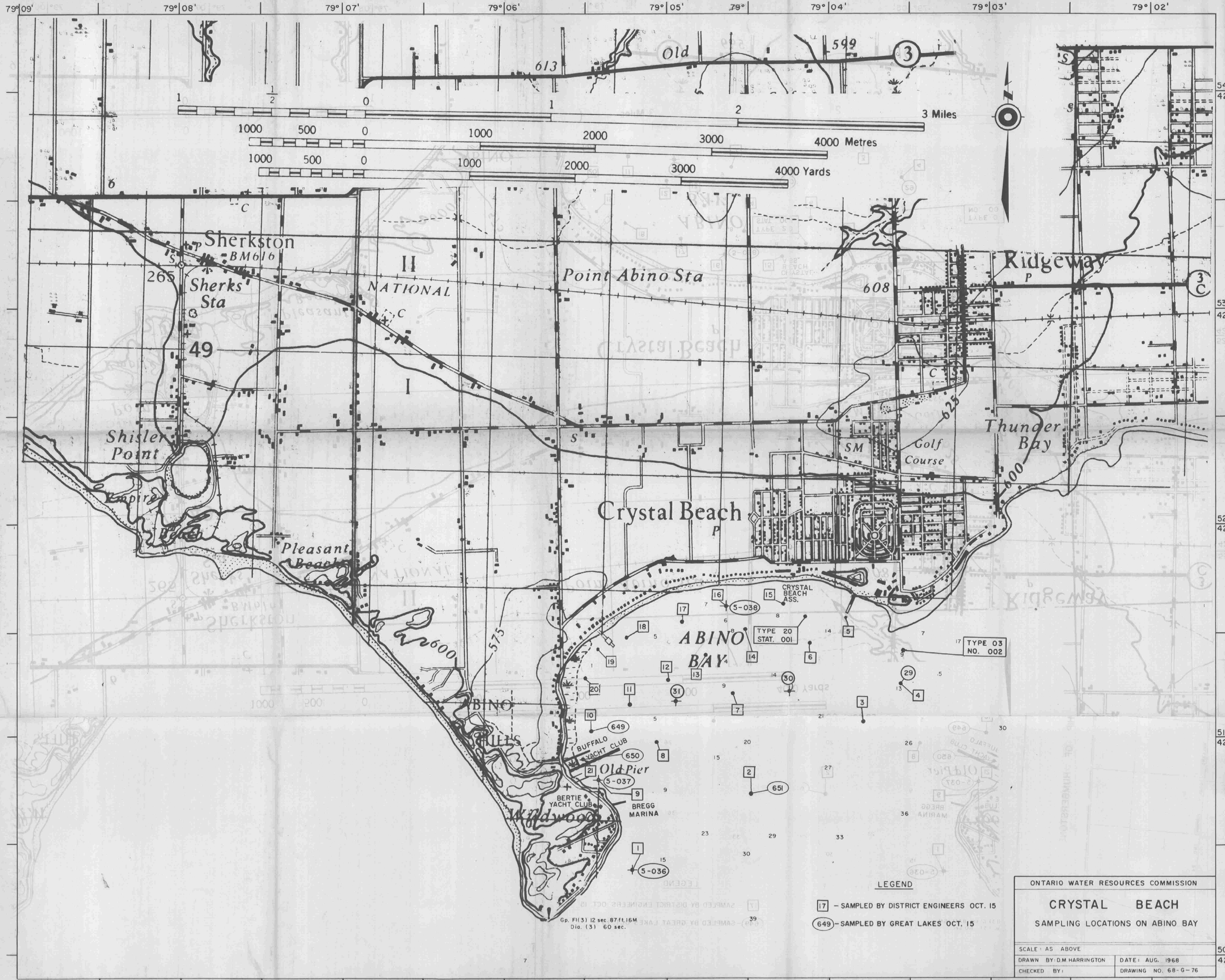
SCALE: 1/4 0 1/2 MILE

DRAWN BY: H.G. & L.L.B

DATE: JAN. 1969

CHECKED BY:

DRAWING No: 69-3-DE



ONTARIO WATER RESOURCES COMMISSION

CRYSTAL BEACH

SAMPLING LOCATIONS ON ABINO BAY

SCALE: AS ABOVE

DRAWN BY: D.M. HARRINGTON DATE: AUG. 1968

CHECKED BY: DRAWING NO. 68-G-76

17 - SAMPLED BY DISTRICT ENGINEERS OCT. 15

649 - SAMPLED BY GREAT LAKES OCT. 15

Gp. FI(3) 12 sec. 87 ft. 16M

Dia. (3) 60 sec.